Best's Insurance Law Podcast

From Incident to Analysis: The Science of Human Factors Investigations - Episode #231

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Qualified Member in *Best's Insurance Professional Resources* since: 2021

John Czuba: Welcome to "Best's Insurance Law Podcast," the broadcast about timely and important legal issues affecting the insurance industry. I'm John Czuba, manager of *Best's Insurance Professional Resources*.

We're very pleased to have with us today Dr. An Nguyen from qualified member expert service provider S-E-A. Dr. Nguyen received her Doctor of Philosophy and Master of Arts and degrees in cognitive science from John Hopkins University and her Bachelor of Science and Psychology from Truman State University. She has over six years of experience conducting behavioral studies with human subjects to understand their cognitive abilities.

Active in her professional community, Dr. Nguyen is a member of the Human Factors and Ergonomics Society (HFES) and the HFES Forensic Technical Group. She is also associated with the Linguistic Society of America. As a Human Factors Consultant, Dr. Nguyen provides consultation on matters including product liability, product safety and instructions, driver behaviors and premises liability.

Dr. Nguyen has experience investigating and analyzing topics, including but not limited to the following: effectiveness of warnings and instructions, product use and misuse, human perception and attention to trip and fall incidents, human decision making, driver behaviors, distraction, and perception-reaction time, worker training and occupational safety, and human interaction with control systems. An, we're very pleased to have you with us today.

An Nguyen: Thank you, John. I'm really happy to be here today as well.

John: Today's discussion is on how human factors impact special investigations. For our first question An, can you tell us, what is human factors?

An: Yeah. So human factors is a scientific discipline concerned with human beings and their interactions with products, facilities, procedures, environments and so on. It looks at how we use products, how we navigate buildings, how we follow instructions or operate machines. It explores how people think, perceive and behave in different situations. To understand why errors happen and how tasks are performed, how designs can align with human capability.

John: So, and what makes human factors as scientific discipline rather than just everyday assumptions about people?

An: Human factors is usually a blend between psychology and engineering. There's a whole lot of science behind people's behaviors and decisions. People's behaviors and decisions are not random. Our actions typically follow patterns that can be studied, explained, and even predicted. Now, much of this decision making happens automatically below our level of awareness, but it is still guided by cognitive processes.

John: So, you're saying a lot of the science has to do with cognitive processes that we aren't consciously thinking about?

An: Yeah. So, let's take jaywalking as an example. Why do some people cross the street outside of the crosswalk? It comes down to weighing costs and benefits. The benefits are clear, getting to the other side faster. The cost is the risk of being hit by a car. If you're naturally more of a risk taker, the cost may feel smaller to you, and if you are in a hurry, the benefit may feel greater.

Now, when evaluating costs and benefits, it is not just about the value of them. It is also about the probability. So, on a quiet street with a low-speed limit, the chance of being hit feels lower. People are more likely to jaywalk if the benefit outweighs the cost. Or the probability of getting the benefit is higher than paying the cost. Then we are more likely to do something.

Importantly though, most people are not consciously running through this cost benefit calculation in their heads. The brain does this in the background. We don't consciously evaluate all those factors as we walk around, but they do play a role in our ultimate decision. And by evaluating personal characteristics, situational contacts, and environmental factors, we can explain and even predict people's choices.

Human factors really digs into these layers to explain why people act the way they do. And this is not limited to just jaywalking. Such principal extends to virtually any decision in our daily life.

John: So An, can you tell us how human factors analysis is typically conducted?

An: One of the main tools we use is behavioral experiments. So, in these experiments, researchers carefully manipulate specific factors. They assign participants to different conditions and then observe or measure how the changes in those factors and conditions would affect behavior.

So by controlling variables like that, we can identify the relationship between the factor and a human decision. We can also use technologies like eye tracking or brain imaging to see how a person's brain reacts to information without them even consciously realizing it.

John: So An, do you need to do an experiment for every human factors analysis?

An: No, oftentimes it would be difficult or even impossible to set up a representative experiment. This is especially true when evaluating claims that involve somebody getting hurt. I mean, good luck finding volunteers for an experiment to determine if a jaywalker is likely to get hit by a car.

So rather what we can do instead in those cases is draw the results of multiple prior studies conducted under controlled scientific conditions. Depending on the situation, we might need to evaluate things like memory, attention, risk perceptions, or the cognitive processes we also consider factors like environmental cues, expectations, training, prior experience, and so on.

So, the key here is knowing which cognitive resources are involved in that task and what factors can influence them and also being knowledgeable and familiar with relevant scientific research in the field.

John: So An, a common misconception is that since everyone has experience making decisions, reading warning signs, or navigating roads that they don't need a human factors expert to understand human behaviors. How would you respond to that?

An: So, as I have briefly mentioned earlier, a lot of our decision making happens at a subconscious level and because of that, even though we all have experience making decisions, it's difficult to explain or break down the many factors that actually influence those choices.

What is more important is that our personal experiences are limited. What makes sense to one person might not reflect how other people think or behave. Then, there are factors, like hindsight by us, that complicate things even more, because once we know the outcome, it is easy to assume that we would have made a better choice when in fact the original choice may have been entirely reasonable given what was known at the time. So, these factors make it hard for people to judge a situation objectively based only on personal experience.

Now, instead of personal experiences, human factors experts would rely on systematic research to understand how the majority of people would react. And in doing so, we move away from biases or the limitations of one's personal knowledge.

John: An, can you give us an example of how human factors analysis is used in forensic investigations?

An: In one case I worked on, a worker placed his hand into a pinch on a machine and suffered a serious crush injury. So, my human factors analysis looked into whether the hazard was reasonably knowable to the worker, and I evaluated this through several factors, including the presence and designs of warnings, the workers training and experience, and what could reasonably be expected as common sense.

So take warnings for example. The machine in this case did have several warnings in place and the warnings were evaluated from different angles. From a communication perspective, they were right next to the hazard zone. They were printed in big black letters on a bright yellow background. And studies show that people notice warnings faster when the warnings include a color signal, word or a pictorial, which were both available in this case.

The language and the warning were straightforward. There was no technical jargon, and it covers the three things that people really need to know: what the hazard is, what to do about it, and what matters.

Then, from a standards perspective, the warnings met NCC 535 requirements and were up to industry norms from a cost benefit analysis perspective. Complying with the warning simply means, keeping his hand out of the pinch point area and action was easy to follow.

Now the worker put his hand there to gain some balance support for the task he was performing, but the same support could have been achieved through safer means. And so the benefits of complying were avoiding a potential severe injury.

While the cause of complying was minimal, there were just slightly less support that could easily be managed through other means. And when you weigh the two, the benefits of avoiding serious harm would clearly outweigh the minor inconvenience.

I also examine what happened once the worker's hand was already inside the pinch point. So, there was a beep that sounded two seconds before the machine activated, and reaction time research shows that a two-second warning in this case should be sufficient for a typical worker to perceive and withdraw a hand.

In addition, as the machine began powering up it generated a vibration that could be felt through the housing tactile cues such as vibrations, a process rather quickly and offer trigger faster reactions from people. Now the worker had also received formal training on the hazard during onboarding and had operated the machines for over a year prior to the incident.

So to recap, before the incident, he had training and on the job experience to be aware of the hazard. Just before placing his hand in the pinch point, he had the opportunity to see the warning signs, which could have reminded him of the risk in case he forgot, and even after his hand was in the hazard area, he would have had enough time to withdraw it safely had he been attentive to his surroundings.

The human factors analysis in this case highlighted the multiple safety layers built into the machine and demonstrated how the worker had multiple opportunities to avoid injury using research data. We were also able to show that the flashing light proposed by the plaintiff as an additional safety measure would not have really changed the outcome because the brain processes auditory and tactile cues, which were already available in this case faster than the proposed visual cues, and this case ultimately settled.

John: An before we close, is there anything else you'd like to share with our audience?

An: Well, first of all, thank you so much for having me here today. I just want to say that human factors is really in everything we do. Sometimes they make life easier, like the 30-seconds button on microwaves that was created after research showed that people value speed and simplicity.

Other times they create frustrations like, you know, a confusing grocery store layout that are intentionally designed to slow you down and keep you shopping longer. So it may be easy to feel that human factors is not real research compared to big abstract or difficult to understand fields like quantum physics because it is so common and intertwined in our daily lives.

But the reality is human factors research influences our experiences in both subtle and significant ways. So its relevance and flexibility make it especially valuable in forensic work and easy to collaborate with other disciplines.

John: An, thanks again very much for joining us today.

An: Thank you, John.

John: You just listened to Dr. An Nguyen from qualified member expert service provider S-E-A. And special thanks to today's producer Frank Vowinkel. And thank you all for joining us for "Best's Insurance Law Podcast." To subscribe to this audio program, go to our web page, www.ambest.com/professionalresources. If you have any suggestions for a future topic regarding an insurance law case or issue, please e-mail us at lawpodcast@ambest.com. I'm John Czuba and now this message.

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